

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	) FCC 04-28
IP-Enabled Services	) WC Docket No. 04-36
	)

COMMENTS OF IONARY CONSULTING

***Introduction***

The Commission's Notice of Proposed Rulemaking *In the Matter of IP-Enabled Services* addresses an unusually complex issue, incorporating an unusually high number of questions. Indeed this Docket has the potential to be one of the most important since the landmark *MTS and WATS Market Structure* cases of the early 1980s, because it fundamentally addresses the same matters. Just as the "natural monopoly" of long distance had been broken down in the 1970s and forced a rethinking of the Separations and Settlement process, the spread of IP-enabled services is forcing a rethinking of the Access scheme that was created in those cases.

The Notice asks *hundreds* of questions. It is not the intent of this Comment to answer each one individually, nor does it seem practical for the Commission to address them independently of one another. Instead, this Comment suggests that an internally consistent regulatory theory should be developed and applied, from which many answers will naturally spring. Current regulatory theory has been bypassed by technology, but this can be easily rectified. It is our suggestion that the Commission focus on the interface, not the technology, and take no action that artificially favors one technology over another. Furthermore, the current scheme of *call classification* has become counterproductive, and should be replaced with a source-neutral fee-for-service model. While previous Dockets have discussed call classification to some extent or other, it is clear that IP-enabled services are the proverbial straw that breaks the camel's back, and demonstrate the futility of maintaining classification. Reciprocal compensation, access, and "exempt" calls should be merged under one regime. The work of the *Intercarrier Compensation* docket FCC 01-132 (CC 01-92) should therefore also end with this Docket. The two dockets' issues are literally inseparable.

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### ***The real issue is not VoIP***

While the Notice addresses IP-enabled services, most notably Voice over Internet Protocol (VoIP), it needs to be pointed out that the primary issue is not VoIP itself. Computer-to-computer VoIP services, those which do not make use of the PSTN, are currently not considered to be subject to Title II regulation, or to telecom-specific taxation. The Commission's conclusion in that respect, in its *Free World Dialup* ruling, was correct and unassailable. While there are some potential fringe issues impacting these services, they are in general best left to the marketplace. There is no dominant provider of computer-to-computer services; indeed, most such activities are not "services" per se but peer-to-peer activities by end users, for which a voice service provider is typically providing only a limited mediation service, such as a directory.

The primary controversy surrounds IP-enabled services that make some use of the PSTN. The Commission's current Rules create a system of classification by which different rates can be charged for technically-similar services. The Telecommunications Act permits but does not require this, providing definitions of "Telephone Exchange Service" and "Exchange Access Service". The Commission has also discovered a third class of calls, "Information Access", which it applies to calls made to (and possibly from) Internet Service Providers. Some states have created yet additional classes, such as "Virtual NXX", "Information Access NXX"<sup>1</sup>, and Foreign Exchange<sup>2</sup> calls, which may be subject to yet one or another regulatory regime. VoIP does not cleanly fit into any of these simple categories. From an end-user perspective, it is

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<sup>1</sup> The New Hampshire PUC has declared that while ISP-bound calls should not be subject to switched access charges, under the FCC's exemption, CLECs should not be allowed to use multiple local NXX codes to provide Virtual NXX service. Thus a separate "IANXX" regime has been ordered.

<sup>2</sup> Whether intrastate FX calls are subject to switched access charges varies; most states do not apparently impose such charges, or do not have uniform rules. Connecticut, however, by way of example, treats ISP-bound FX calls as exempt, but voice FX calls as access. Several states, such as Illinois, permit reciprocal compensation for local calls but treat FX calls as bill-and-keep, neither local nor toll.

sometimes a substitute for Telephone Exchange Service and often a substitute for Exchange Access Service, while it displays many of the characteristics of Information Access.

The access charge system is, at heart, an *entitlement* program for LECs. Switched access calls cost no more to carry than local, but are accounted for differently. This naturally creates demand for arbitrage. The ESP exemption is a curious legal fiction, allowing the Commission to assert jurisdiction without invoking access charges that are clearly inappropriate for ISP-access modem calls. But the ESP exemption is, in effect, being used by some VoIP providers as an entitlement program for anyone with “Internet” in its name. This Docket raises, in effect, a question about when one entitlement trumps the other. That is a counterproductive approach. Entitlements are a poor substitute for rational regulation and fair compensation.

Some present-day applications of VoIP are in fact arbitrage, taking advantage of the Commission’s tentative policy, outlined in the 1998 *Report to Congress*, that “computer to phone” calls are not subject to the same Switched Access charges as ordinary Telephone Toll Service providers. This is not really a question of technological progress *per se*. It is an example of technology being used in order to exploit a regulatory anomaly. This is not an isolated loophole; rather, it is an example of a regulatory container that has become increasingly porous. There are, of course, many non-arbitrage applications for VoIP, with varying degrees of transparency to the end user. These are less controversial, because they do not depend upon regulatory favors. The Commission need merely protect them against unwarranted intrusion, such as by over-zealous state regulators.

The capital markets currently favor VoIP; both equipment vendors and service providers have far easier access to capital when they say that they are providing VoIP.<sup>3</sup> TDM and ATM<sup>4</sup> are unfashionable, even though they carry the lions’ share of traffic today, and do it well, at low cost. (In this case, *cost* must be distinguished from *price*. TDM providers are apparently far less amenable to pricing below cost than VoIP providers.) This has resulted in a self-fulfilling prophecy. VoIP grows because it is funded, and it is funded because it grows. Favorable

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<sup>3</sup> A 1999 Lucent Technologies web page describing features and benefits of a (since-discontinued) VoIP add-on for the 5ESS listed VoIP’s benefits as “Wall Street Image” and “Access to Capital”.

<sup>4</sup> Verizon Communications has begun to deploy ATM voice tandems, such as the one in West Orange, NJ. However unfashionable, ATM usage continues to rise.

treatment to one specific technology is not appropriate. It is bad industrial policy as well as very bad regulatory policy.

## VoIP is not well defined, Part I – Defining the IP layer

The Commission asks, in part III of the NPRM, to address the categorization of IP-enabled services. We suggest that the NPRM is only scraping the surface of a very complex question. Substitutability, functional equivalence, and peer-vs.-network service are all interesting criteria which may be useful. But there are more questions that need to be examined. “Other grounds for consideration” must include the fact the mere definition of “IP” is itself unclear, and that *any* classification regime based upon its specific presence is thus doomed to failure.

Among “IP-enabled services”, there is considerable room for variation. Just what constitutes VoIP, or what is an “IP-enabled service”? *If* the Commission were to grant technological favoritism to such services (which we do not recommend), it would face a problem in drawing a line that defines what are, and what are not, “IP-enabled”. Because VoIP is a broad technological category, it can be deployed in many different ways, often in conjunction with other media.

To begin with, “Internet Protocol” is not tightly defined, and is subject to change. What is now primarily called “IP” is Internet Protocol Version 4 (IPv4), as currently defined by the Internet Engineering Task Force<sup>5</sup>, in a relatively fluid, largely market-driven, process. IPv4 is itself over twenty years old, having replaced “NCP” as the core protocol of the ARPAnet by 1983. During the 1980s, the International Organization for Standardization (ISO) was working on a competing set of network standards, called OSI (for Open Systems Interconnection), which itself included an “Internetworking Role” and a “Connectionless Network Protocol” (CLNP) that was semantically very similar to IP, but with more flexible addressing. For a time, it appeared that CLNP would supplant IP in the marketplace. Over a decade ago, the IETF then defined a new protocol, which it named “IPv6”. At one point, the Internet Activities Board, overseer of the IETF, had tentatively selected a profile<sup>6</sup> of ISO CLNP as a replacement for IPv4, but in 1994 it switched to IPv6, which it has been promoting ever since with little success.

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<sup>5</sup> The original IP definitions were the property of the Department of Defense, of course, as part of the ARPAnet, but the IETF is now the primary nexus of multivendor IP-related protocol development.

<sup>6</sup> ISO CLNP as a substitute for IP was called “TUBA”, for “TCP and UDP with Bigger Addresses”. See RFC 1347, 1992.

There are other protocols that have similar characteristics, though less popular nowadays. The Novell IPX/SPX protocol suite, for instance, which was closely related to the Xerox XNS suite, was quite popular before the public Internet made TCP/IP the de facto standard. DECnet and SNA were very popular for a time. IP is their contemporary. Asynchronous Transfer Mode, an information transfer mechanism originally developed by the CCITT's Broadband ISDN program, also provides high-speed packet-mode communications, while Frame Relay provides a medium-speed medium. While ATM and Frame Relay are typically used *beneath* IP for the transmission of data, they are better suited than IP for the transmission of voice, because they are connection-oriented and can offer specified quality of service (QoS). For a time, in the early 1990s, ATM was even being suggested as a successor to IP, a function that it would have been technically capable of providing, if enough users had agreed. Multiprotocol Label Switching (MPLS), an IETF-designed protocol, is semantically quite similar to Frame Relay and is also used beneath IP, especially for QoS-critical applications such as voice.

Much VoIP, in fact, rides atop ATM, MPLS or Frame Relay. In some such situations, the IP layer itself (as defined by its header) is often unnecessary, simply a waste of bandwidth. This leads to another interesting and well-established option, IP header compression. Originally developed in the 1980s for use on slow dial-up connections, standard (as well as proprietary) techniques exist to replace the IP header with as few as two bytes of "compressed header" information. Most VoIP also makes use of User Datagram Protocol (UDP) and Real Time Protocol (RTP) above the IP layer and below the actual voice information payload. These too are sometimes subject to compression. So if VoIP is run with maximum header compression atop Frame Relay, it is *almost* the same as Voice over Frame Relay.

The IETF Internet Protocol itself was designed many years ago, originally for the ARPAnet, and there is considerable reason to suggest that it is no longer particularly well suited for the tasks to which it is put. While the Internet itself is existence proof that IP can be used very flexibly, the overall bandwidth efficiency of IP networks is not high, and numerous tweaks have been made to it over the years to adapt to changing requirements. Pending Senate bill S.2281 includes, in its definition of "VOIP Application", the phrase "...communications over the public Internet or a private network utilizing Internet protocol, or any successor protocol, in whole or part...". If federal statutes or regulations enshrine IP *per se* in a different manner from competing protocols that may be developed, then the regulations will have a perversely chilling effect on technological innovation. What constitutes a "successor protocol" and who decides? If regulations were to automatically favor the IAB or IETF's choices of new protocols, as they

evolve, then IAB or IETF would inherit the de facto status of quasi-autonomous non-governmental organization (*quango*), with regulatory power, in probable violation of the Administrative Procedures Act. Protocol development and networking research elsewhere would be stifled. The IETF itself would not necessarily want to change its procedures to become a more suitable regulator.

## VoIP is not well defined, Part II – Encapsulation and Hybridization

Setting aside for now the issue of what constitutes IP, a second and more practical near-term question concerns what constitutes VoIP, or what constitutes an IP-enabled call. How much IP does it take to make a call count as “IP-enabled”? The pulver.com *Free World Dialup* petition that the Commission granted in early 2004 (FCC 04-27) concerned a very clean case, computer-to-computer voice, wherein there was no connection to the PSTN (unless the subscriber was using a PSTN modem, or ISDN, to access the ISP). Its voice service was simply an application of an existing data network; there was no serious potential to apply PSTN regulatory constructs to it. It would, indeed, not be *possible* to apply PSTN regulatory constructs to it; were it to try, users would simply flout any such rules. Witness, for instance, the current situation in South Africa, where Telkom claims that such services are illegal, but is routinely ignored. At the opposite end of the spectrum, the Commission held in the recent *AT&T* case (WC Docket 02-361), quite rationally, that under current rules, “phone to phone” calls are telecommunications, even if they include some transparent VoIP component in the middle.

But there are many other ways to use VoIP, particularly “hybrid” phone-to-computer and computer-to-phone situations, with various amounts of IP. Creating any kind of bright-line test for what constitutes “VoIP”, or an IP-enabled service, will be difficult at best. If one is adopted, and it provides an arbitrage opportunity, one can expect network operators and their suppliers to rapidly adapt to it. Indeed, if the test depends on whether the subscriber instrument or other customer premises equipment is a “phone” or a “computer”, a rapid migration may occur away from CO-powered “lifeline”-grade POTS telephones to locally-powered IP-enabled telephone sets, merely for the arbitrage.

It is hard to draw a firm line around just what is VoIP; a number of permutations are imaginable. Here are just some examples of calls that may or may not be considered VoIP.

1. Uncompressed TDM voice is placed into IP packets, a few milliseconds at a time, carried over a dedicated (voice-only) lossless network. This is already done in numerous IXC networks, transparently to the caller.

2. Uncompressed TDM voice is placed into packets, a few milliseconds at a time, with *compressed 2-to-4-byte packet headers*, carried over a dedicated (voice-only) lossless network. This is more efficient than case 1 above, and may see occasional use already.
3. Uncompressed TDM voice is packetized as above, but the packet headers are called "Frame Relay" or "ATM", not IP or "compressed IP". This more readily permits QoS-assured voice to share a physical link with "best effort" (literally, worst-effort) IP traffic, but the voice traffic is not technically part of the IP stream.
4. Uncompressed voice is time division multiplexed on a physical pipe with time slots that also contain IP-encapsulated data. This, of course, is how TDM networks share voice and data.
5. Uncompressed voice is time division multiplexed on a physical pipe with time slots that contain IP data, but gratuitous IP headers are regularly placed into the voice time slots. This meets one possible test of VoIP-ness.
6. Voice is placed into packets a few milliseconds at a time, *compressed to 32 kbit/second ADPCM* if a modem tone is not detected, with "compressed IP" 2-to-4-byte packet headers, carried over a dedicated lossless network. This is like case 2 above, a common strategy for making up the bandwidth lost to VoIP headers, without noticeable degradation of call quality. One can argue that the speech compression is a form of information processing, but it is a form widely used within telephone networks and is transparent to users.
7. Voice is placed into packets 20-40 milliseconds at a time, *compressed to a low bit rate* with a vocoder such as G.729 or G.723.1, "compressed IP" 2-to-4-byte packet headers are applied, carried over a dedicated lossless network. This is like case 6 above but the audio quality is noticeably degraded.
8. What if the ADPCM or low-bit-rate voice in cases 6 and 7 used uncompressed IP headers instead?
9. If dedicated voice circuits were too close to "telecommunications" to gain the favorable treatment granted to voice that traversed "the Internet", what if the dedicated lossless VoIP networks of cases 1, 2 and 5 were replaced by links that carried, as 1% of their traffic, some IP data packets from an affiliated ISP? What if

data packets were 20% of the traffic? Does a “de minimis”, “contamination”, “substantial amount”, or “safe harbor” test apply?

10. What if the backbone link in case 9 used MPLS to provide voice traffic with the necessary QoS, while carrying a substantial plurality of data as well? Would it matter if the voice were compressed? Would it matter if the IP headers were compressed, or if a voice-carrying layer were converged directly over the MPLS layer without even using an IP header? Would it matter if Frame Relay were used instead of MPLS, or if ATM were? These are permutations that lead to a vast number of potential combinations whose effectiveness has not yet been widely researched.
11. What if a new packet protocol, not called "IP", were to emerge, which carried both voice and data with their native QoS requirements met? What if ATM, sans IP, were revived for the same purpose?
12. What if the dedicated lossless networks described above were instead shared with data bound to and from the public Internet, or were carried across public Internet backbone links of an affiliated provider? What if the Internet provider were not affiliated with the voice provider?

These are merely examples of what may or may not be treated as VoIP, if it were to matter. The *AT&T* decision moots the issue when both ends are PSTN-attached telephones, but the same questions arise in the open case of hybrid “computer to phone” calls. Vonage, for instance, uses IP with no QoS guarantees in a “parasitic” manner atop a subscriber’s broadband link. PacketCable networks, on the other hand, are typically provisioned, with QoS assurances, by the operator of the underlying broadband (cable) network. Time-Warner Cable has asserted that its PacketCable VoIP service is “exempt” from local telecommunications regulation. State Public Utilities Commissions are not amused. The Maine PUC, for instance, has explicitly denied that claim and required Time-Warner to tariff its IP telephony service as a CLEC offering. Comcast offers TDM/FDM-based cable telephony on a CLEC basis with no claims of exemption; its service is functionally indistinguishable from PacketCable. Should it be penalized for having deployed its system before VoIP-based PacketCable was ready? We suggest that it should not, but it would be a perverse result of favoring VoIP over equivalent services.

The boundary between “computer to phone” and “phone to phone” is itself unclear. The terminating LEC has no way of determining if the call originated on a “computer” or “phone”,



leading today to a problem in properly assessing intercarrier revenues. Based on the Vonage precedent in Minnesota, a voice-to-IP gateway, or any IP encapsulation device, at a customer premise can be deemed a computer. (The Commission can, of course, use this Docket as an opportunity to create a more stringent definition, but that would simply shift the boundary of the problem.) Thus a PBX system with a VoIP trunk card may be viewed as a “computer” and its outgoing calls “exempt”, as is a PBX system mated to a customer-premise gateway, even one provisioned by an interexchange carrier. But if the carrier puts the gateway elsewhere, such as at its own premise, the call is now presumed “phone to phone” and subject to different treatment. The carrier at the distant end of the call, however, has no way of knowing if the originating end of the call does or does not meet the exemption test. Local calls are typically distinguishable from switched access calls based on the Calling Party Number, but that carries no clue as to whether an originating PBX trunk interface, for instance, was “IP-enabled” or not. This creates a system that is prone to abuse and nearly impossible to audit.

It is thus abundantly clear that VoIP often does not fit into convenient regulatory baskets. We thus turn to the baskets themselves, and present a suggestion for the “proper legal classification and appropriate regulatory treatment of each specific class of IP-enabled services they have identified” [NPRM at 42].

### ***The PSTN monopoly is what requires regulation***

“The Internet” itself has never been regulated in the way that telecommunications services are. It is a free market economy of its own, with no dominant providers. Indeed antitrust regulators (notably in the European Union) strenuously objected to mergers that would have given Worldcom significant market power in the Internet backbone arena. Contract disputes over peering are solved privately, or via non-regulatory means, befitting a highly competitive market.

The PSTN is of course very different. Incumbent LECs had *de jure* monopolies until 1996, and still retain monopoly power, as well as literal monopolies over many essential facilities. Total deregulation of the PSTN would result in a reduction in competition, because dominant providers would have incentive to discriminate against, or potentially not even interconnect to, their competitors. The Telecom Act recognizes this and provides a path towards demonopolization, which could in theory eventually lead to a fully-competitive marketplace. But that is many years away, and requires the continued vigilance of the Commission.

“Computer to computer” VoIP does not make use of PSTN services, and as noted above, it is simply impossible to apply telephone-style regulation to it. Thus it is important to focus on

the PSTN and its relationship to IP-enabled services. The key question is not how to regulate VoIP. It cannot be regulated *per se*. The key question, then, is how to regulate the monopoly LECs at the boundaries between their networks and IP-enabled networks. This can best be answered via a more general examination of the proper boundary regime for local exchange networks in general.

### ***The problem is the fact of classification, per se***

The current regulatory regime for the PSTN is based on a system of call classification that dates back to the *MTS and WATS Market Structure* rulings that followed the *ENFIA* agreement of 1978. These were, in turn, adopted as a replacement for the Separations and Settlement regime that was adopted in the wake of 1930's *Smith vs. Illinois Bell* decision. That decision favored "station to station" accountability for long distance calls, rather than "board to board" accounting, which AT&T at that time apparently preferred. When Mr. Smith went to Washington, long distance telephone calls were still a relative novelty, an expensive luxury consumed primarily by businesses and high-income individuals. Taking a fraction of the price to support local telephone and pay-phone service seemed like a good way to improve access to, and thus the utility, of the network. Of course that was three-quarters of a century ago, and much has changed since then, but the regulation of the American PSTN is still based on the same assumptions, that long distance calling is a luxury that should be identified and, in essence, surcharged.

Classification regimes tend to produce conflict in borderline cases, where the appropriate classification is unclear, and new technologies have been straining at the *Smith* regime since the *Execunet* case of the 1970s. In that instance, MCI tariffed foreign exchange service, whose local usage minutes at the time were not surcharged, and then created a switched service out of it. Because this was such a direct substitute for Message Toll Service, it led to the creation, in 1978, of the Exchange Network Facilities for Interstate Access (ENFIA) tariffs. In the subsequent *MTS and WATS Market Structure* proceedings, ENFIA was generalized into the Access regime that exists today. Feature Groups B, C and D (noting the post-divestiture terminology; divestiture was coincidental with, and not causal of, the access charge system) provided trunk-side connectivity and were always technically distinguishable from subscriber connections. Line-side Switched Access and interstate Foreign Exchange were defined as Feature Group A, whose technical characteristics mirrored subscriber interconnection. This was a borderline area that has been subject to conflict over several points.

## The “modem tax” conflict was a precursor to the confusion to come

Probably the best-known conflict over the access/local question concerned its application to calls made to enhanced service providers. The 1983 *MTS and WATS* ruling allowed these providers to make use of local business rates, rather than Feature Group A, although they had a certain amount of jurisdictionally-interstate traffic. The Commission in 1987 suggested changing this, and a huge public outcry greeted this proposal, nicknamed the “modem tax” (although, unlike tax revenue, the money would have flowed directly into the coffers of the LECs, not the government). In the common view of the public – a perfectly rational one, with considerable justification – dial-in calls to on-line service providers, using local numbers, were local calls. The Commission finessed the issue in 1988, ruling that while it did not give up its nominal jurisdiction over traffic with an end-to-end interstate component, it would deign to “exempt” such calls from the application of Feature Group A rates. The “modem tax” as a political issue faded, though it remained for several years as a persistent chain letter on the Internet, and also as a dream of the monopoly Local Exchange Carriers. (Indeed that dream-cum-nightmare has not fully died; witness the *ex parte* presentation of the National Telephone Cooperative Association in this Docket, calling for the end of the “exemption”.)

Come 1996, with the growth of the Internet, some (now “Incumbent”) LECs raised the issue with the Commission again. Ex-parte “white papers” calling for the elimination of the “exemption” were filed by both Bell Atlantic and Pacific Bell. Both cited the allegedly high cost of carrying the rapidly-growing traffic to the newly-public Internet. It is quite clear that the Internet’s benefits have been great, and that had these ILECs’ views been accepted, the growth of the Internet would have been tremendously crippled. The cost to the economy would likely have been many times the amount of extra profits that might have been made by the ILECs.

But it is also noted that the special “exempt”, vs. “local”, status of calls to what the Telecommunications Act of 1996 calls “Information Service Providers” has led to ongoing conflict between ILECs and CLECs. Reciprocal compensation was tentatively settled by the Commission (noting a pending, if unenforced, remand) in 2001, but ILECs and their competitors are still arguing over many other issues of ISP-bound traffic. These include, but are not necessarily limited to, the following: Who pays for the trunk facilities used to carry ISP-bound calls, under 47CFR51.709(b)? If an ISP’s modem pool is not within the geographic local calling area as defined by an ILEC, and a CLEC is providing a foreign exchange or “Virtual NXX” service, can the ILEC charge the CLEC switched access? Can the ILEC charge the caller retail tolls for calls? Can a CLEC make use of numbering plan resources for such modems?

This is all germane to “IP-enabled” calls because the primary justification for allowing special treatment for IP-enabled calls is that they are “exempt” from Access charges under the 1983/1988 ESP Exemption, even though they are not classified as “local”. And, as noted above, any attempt to draw a bright line between VoIP calls and non-VoIP calls is doomed to failure. The technology is too fluid.

Under the Commission’s 1998 tentative interpretation, “computer to phone” VoIP calls are, in essence, eligible for “board to board” treatment. The IP network’s cost is presumably borne by the subscriber, but the terminating LEC does not receive a contribution. This has helped facilitate the growth of *parasitic*<sup>7</sup> VoIP telephone services, of which Vonage is now the best known. Parasitic services interface to the PSTN (typically via subscriber-like digital connection to a CLEC), but neither draw separations revenues from it, and are not required to pay access fees into it. The marketplace seems to be saying that, for many users at least, this is more desirable than the “station to station” approach that has applied to toll calls since *Smith*.

No doubt many Local Exchange Carriers would prefer that the Commission strictly enforced the earlier *ENFIA* standard, and required the PSTN interface to a long-distance service to be charged switched access, rather than local rates (typically in the form of reciprocal compensation, which in turn is often bill-and-keep). But the ENFIA standard itself may have been superseded by the Telecom act, whose black-letter definition of Exchange Access Service is not based on whether a call is “local”, but on whether it is “telephone toll service”, for which, again by black-letter definition, a usage fee is collected. *Any* flat-rated service, whether IP-enabled or not, can arguably meet a test of *not* being telephone toll service, and thus not being required to pay for Exchange Access Service. And, given the realities of the market, a carrier can easily make any service into an IP-enabled one, if that is what is necessary to reduce one’s access bill.

The computer-to-phone and phone-to-computer IP-enabled cases all hinge, under current rules, on the classification of some voice calls as “exempt” “information access”. Attempting to reclassify phone-to-computer and computer-to-phone as non-exempt switched access, while no doubt attractive to at least some LECs, is still likely to be difficult to enforce<sup>8</sup>. The Internet does

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<sup>7</sup> That word is used here in the technical sense, because the service draws upon bandwidth already purchased for information access, and is not intended to be pejorative.

<sup>8</sup> One possibility might be to require an accurate Calling Party Number to be provided at the handoff to the terminating carrier. However, not all computers that originate such calls necessarily *have*

not follow the same geographic rules as the PSTN. Its address space is not cleanly geographic. Its topology does not obey LATA, state, or even national boundaries. And there are many IP-enabled calls that are truly “local”, so it is not reasonable to assume that all IP-enabled calls would be subject to switched access charges even if they were not exempt. Attempts to patch the *ancien regime* to fit the IP-enabled world are doomed to failure. For every problem put down, another one will spring up. It is likely to resemble the arcade game, “Whack-a-Mole”.

In other words, the jig is up. The Commission’s job now is not to save the Access system, nor to create a permanent arbitrage opportunity<sup>9</sup> for one technology over another, but to create a clean transition to an alternative model.

### All classification is pernicious; compensation should be uniform

Call classification has been contentious since at least the 1970s. In an IP-enabled world, it is untenable. But this is true of classification *in general*, not merely relevant to IP-enabled services. The appropriate approach is to remove *all* call classification, and to move to a unified cost-based fee-for-service scheme that applies equally, and naturally, to all PSTN connections.

A simple way of viewing this is to say that “Calling Party Number” should no longer be used in computing compensation due to carriers, nor should the carrier’s charges take into account other geographic or technological factors such as MSA or whether the call is “enhanced”. Price should be only based on destination number vis-à-vis the Interconnect Point.<sup>10</sup>

At the wholesale level, where calls are handed off to, or received from, a LEC for completion, there are presently two common types of Switched Access interface. Feature Group D is the “premium” option used by most long distance carriers, providing 1+ dialing. Feature Group A is what results when an interface type (analog, ISDN, channelized T1) normally used by

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telephone numbers. One example would be a computer-to-computer network, using non-numeric naming via a directory service, with an outgoing call gateway to the PSTN. Imposing a CPN requirement would thus necessarily complicate some VoIP networks.

<sup>9</sup> Recognizing, of course, that “permanent arbitrage opportunity” is probably an oxymoron.

<sup>10</sup> While the term “Interconnect Point” is widely used in inter-carrier contracts to identify the point of fiscal handoff, and often abbreviated to two letters, these initials are unfortunate in the context of this Docket, and the term will not be abbreviated herein. The point of *physical* handoff, for the purpose of responsibility for maintenance, is more often called the Point of Interconnection (POI).

subscribers is instead used for Exchange Access. At the time the Switched Access tariffs were first written, ca. 1983, Feature Group A was typically a line-side analog connection<sup>11</sup>. Nowadays most connections are digital, and the main difference between Feature Groups A and D is in signaling protocol. Calls made over any Switched Access facilities are billed under either state or FCC tariff, depending upon the nominal jurisdiction of the call.

At the *originating* end of an IXC call, Feature Group D is technically very different from Feature Group A, with only the former offering 101xxxx dialing, 1+ presubscription, Signaling System 7, and various other features appropriate for interexchange carriers. One can expect a considerable demand for this service to persist.

At the *terminating* end, the difference is smaller. Feature Group D sends the *correct* Caller ID. (ISDN PRI used as Feature Group A can often, however, provide an arbitrary Caller ID string, which *could be* correct.) If a phone-to-phone VoIP provider (or anyone else for that matter) is connected to an ILEC network with local exchange facilities (such as ISDN PRI), it is “on its honor”, bound by current regulation, to tell the LEC whether it is terminating “local” calls, “ISP” (exempt) calls, or “switched access” Feature Group A calls. This is even more complicated when a two LECs are involved.

As noted by 2003’s revelations of “call laundering” by MCI, it is tempting and easy for a carrier to incorrectly classify the traffic it is sending. MCI took interstate long distance calls and re-originated them on CLEC networks in the destination LATA, with the Calling Party Number indicating a number within the destination LATA, rather than the true originating number. MCI benefited because they did not pay the terminating ILEC their Switched Access rate. The CLEC benefited in a more roundabout manner: Under the *ISP* ruling, a CLEC, whose ILEC local traffic was more than 3:1 out of balance, terminating more than it was originating, was assumed to be receiving ISP-bound calls, which were typically not eligible for reciprocal compensation. If the same CLEC thus *originated* traffic towards the ILEC, its aggregate traffic would be less out of balance. Each originating minute would potentially cost one minute of reciprocal compensation, but free up three minutes of inbound reciprocal compensation, netting a profit of two minutes’ worth of reciprocal compensation. Thus the CLEC might have effectively been *paid* to send calls

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<sup>11</sup> Line-side analog connections not only had inferior signaling, but were typically at a lower signal level, because the transmission loss plan viewed them as terminals, not intermediate points. Digital connections do not have loss inserted; required loss is added at the final analog conversion, be it the handset or PBX. Digital T1-level ports are typically provisioned from the trunk ports of a digital switch.

to the ILEC. This is, of course, “gaming the system”, but such gaming is inevitable when the compensation system is as baroque as it is.

Note that under the current “computer to phone” rule, *if* the re-originated call were generated via a “computer” on the subscriber’s premise, even something as simple as a VoIP adapter on a broadband circuit, then this “call laundering” is no longer a violation of any rule, because the call is no longer required to be treated as Switched Access, but it is in fact perfectly legal and proper exempt traffic! This is the result of the *three-class* system now in effect.

None of this would matter if classification were not the rule, and a fully unified compensation regime were adopted. This simplifies the destination end of multi-provider calls. The call would be handed off to the terminating LEC, and the terminating LEC would be paid to deliver it from the handoff point to the destination. This payment might be on a per-minute basis, with cost-based fees for end-office termination and, if actually used for the completion of a call, tandem switching and inter-tandem routing.

Removing classification is even more critical at the originating end, because originating Switched Access legs of calls are billed *collect*, to the IXC, while local exchange and exempt calls are billed sent-paid, to the caller. Phone-to-phone VoIP “overdial” services, like Execunet before them, could still benefit by having the caller rather than the IXC pay for the originating leg. But it is unlikely that most subscribers would switch to such services in order to save, say, a half-cent per minute on toll calls.

## Feature Group A is the heart of the problem

The problem of classification for a wide class of IP-enabled calls is easy to repair. To begin, the Commission need merely declare that there is no longer such a thing as Feature Group A. Such circuits would become local exchange service or local-traffic interconnection. Then there is no question as to whether a VoIP provider is “local” or “access”, because there would be no distinction made. No service provider of any kind, ISP or VoIP or interexchange carrier, would pay to receive 10-digit-dialed<sup>12</sup> local-number calls. The so-called ESP Exemption would also be mooted; ISP-bound calls would no longer be in a regulatory netherworld, but would be treated entirely the same as local calls. The *Virtual NXX* question would be reduced to a technical one about numbering-plan resources and tandem costs; there would be no basis to impose

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<sup>12</sup> This could, of course, be 7-digit or 11-digit dialing, depending upon local custom.

originating Feature Group A switched access rates, which many ILECs have called for, on these calls.

Originating access is now billed collect; in an unclassified system, it would be sent-paid, and the originating LEC would have to recover this directly from the caller, most likely via higher fixed monthly rates. But to some extent this can be ameliorated by continuing to charge interexchange carriers fees for the Feature Group D capability set. They are most valuable on the originating side, and thus the (perfectly voluntary) fee could offset or even exceed the reciprocal compensation that might be owed by making these call-legs sent-paid. Fees could also be imposed for 800-number origination, a discrete and technically-distinguishable service with costs of its own.

Ignoring for the moment the *ISP* decision's creation of the "information access" class, successor to "exempt", as a way to avoid allegedly-excessive reciprocal compensation charges, the CALLS rate is within the typical range of pre-*ISP decision* reciprocal compensation. Indeed in some cases switched access is cheaper than reciprocal compensation. Switched access is also not subject to current limitations on reciprocal compensation, found in most but not all CLEC-ILEC interconnection agreements, that limit it to calls that remain within ILEC-tariff retail local calling areas. Such restrictions would also have to become moot anyway, as the local calling area, when applied to wholesale handoff, is itself again a classification artifact.

Classifications of call handoff between LECs as "local" or "switched access" are another source of conflict, as well as being anticompetitive. If a call is handed off to an end office, the recipient carrier should be compensated for its cost, or in the general case of a CLEC, the ILEC's equivalent cost, of local termination. If a call is handed off to a tandem office, the recipient should be compensated for tandem switching and interoffice haul as well. Whether a given call is IP-enabled or not, the carriers involved should be compensated for their efforts. Those compensation levels, though, should be cost-based, not "supracompetitive" or "contributory".

### ISP-bound calls are necessarily impacted

A CLEC switch serving ISPs is no different from any other end office. Switched access charges levied against the *recipient* CLEC for Virtual NXX calls are an example of the kind of nonsense that results when classification runs amok. This question, which is admittedly part of another Docket, would naturally be moot by ending call classification. The *ISP* decision should also be moot, because it establishes a classification regime of its own that, as noted above, invites



gaming<sup>13</sup>. However, the CLEC terminating the calls, whether local, toll, or ISP-bound, should not be compensated for tandem switching *based on* the current 47 CFR 51.711 definition of serving area, as this allows all CLEC-bound calls, for some CLECs, to be charged the tandem rate. A local exchange carrier (ILEC and CLEC alike) should be required to hold out an “end office” interconnect point for every prefix code, rate center, or location routing number that it serves. A CLEC might, like an ILEC, choose to offer both tandem and end office interconnect points, but the originating carrier should always be given an end office option. This would reduce the cost to the ILECs of paying ISP-bound reciprocal compensation, without the perils of classification.

### Capacity-based interfaces

Usage-based intercarrier charges are not the only way to implement an unclassified regime. Capacity-based (bandwidth) interfaces could also be made available. This is more common in the Internet world, although telephone carriers do charge each other for trunk ports. In such a system, a LEC might offer tandem or end-office ports for a fixed monthly price that reflects the full cost of switching, not just the trunk port cost<sup>14</sup>. Capacity-based pricing encourages off-peak discounts, potentially increasing network efficiency. But it may have difficulty scaling down to small sizes, because the basic PSTN TDM interface nowadays is the DS-1 port. Low-bandwidth packet interfaces – and it is likely that carriers in the future will offer both packet and TDM interfaces – may suffer from excessive latency. Also, in the IP world, interfaces are often sized well above required levels, because high-capacity Ethernet-style ports are relatively inexpensive. Some kind of usage cap or bandwidth measurement might still be required for such interfaces to be used under a capacity-based pricing regime. For these reasons, capacity-based pricing may not be desirable as the sole option.

### Substitutes for Access funding

Switched Access Service revenues currently contribute significant revenues towards the fixed costs of local exchange service. While this is no longer nearly as major a source of funding to the Price Cap ILECs as it was in the mid1980s, it remains very important to the rural carriers,

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<sup>13</sup> The remand of the *ISP* Order would also, it seems, be cleanly addressed.

<sup>14</sup> For example, a carrier might charge \$.001/minute plus \$100 per DS1 port. At a typical 200,000 minutes, the port will generate \$300/month of billings. It could also be charged at a flat-rate \$300/month.

such as those on the NECA access tariff. These companies will require help to avoid the severe disruption of going “cold turkey”. Several possibilities are suggested. Maintaining call classification for these carriers only is not among them.

The High Cost fund can be increased somewhat, and can continue to be collected on telecommunications services *used for* Internet access, such as DSL, as well as on tolls, assessed in a technology-neutral manner. (This requires DSL to remain a “telecommunications service” used by ISPs, rather than be reclassified an ILEC-self-provisioned information service, as suggested in FCC 02-33.) “Computer to computer” VoIP does threaten some fraction of its possible revenues, so this cow’s milk supply is limited. High cost support can also be reduced somewhat in order to allow rural fixed telephone rates, especially business lines and (as recommended by the Federal-State Joint Board) non-primary lines, to recover a larger fraction of their cost<sup>15</sup>. Rural companies can also be awarded wireless bandwidth, for example in the 700 MHz segment, in order to use full-quality Wireless Local Loop in lieu of high-cost long loops.<sup>16</sup> The rural tail should not, in any case, be allowed to wag the dog in the way that it has for the past several decades.

Some suggestions have been made, notably in the *Intercarrier Compensation* NPRM, that bill and keep is a potential substitute for intercarrier payments. This has the apparent advantage of simplicity, but it raises several risks of its own. Not the least of these is the cost to rural carriers. In a bill-and-keep arrangement, who pays for interexchange transport and tandem switching service? Most rural carriers depend on a larger ILEC’s tandem. The *Central Office Bill and Keep* (COBAK) proposed by DeGraba and described in CC 01-92 provides rural carriers with no compensation for termination of local calls, but provides large tandem providers with compensation for connecting other carriers to the rural carriers. CLECs, like rural carriers, are likely to depend on large ILEC tandems. A COBAK-type scheme would thus have the possible net result of enriching the largest ILECs at the expense of small carriers.

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<sup>15</sup> It is noted that many rural carriers maintain basic 1FR and even 1FB local service intrastate tariff rates below \$10/month, well below the levels of urban ILECs with lower costs.

<sup>16</sup> The author notes the abrupt manner in which the Wireless Telecommunications Bureau dismissed such an idea when this author submitted them in WT 02-353; this may be attributable to the fact that WTB is responsible for spectrum licensing while the Wireline Competition Bureau is responsible for access charges and related issues.

## Direct and Indirect Interconnection

Some questions still arise when dealing with VoIP services that do not *directly* interconnect with incumbent LECs and other dominant carriers. For example, does Vonage or a similar carrier require state certification as a local exchange carrier if its service is a substitute for such service?

A straightforward answer to this is to say that while *direct* interconnection to a dominant carrier, such as an ILEC, requires certification, an *indirect* connection does not. These VoIP providers require interconnection, telephone numbers, and other benefits of certification. But those can be provided, for example, by an intervening CLEC. In such cases, the VoIP provider is essentially a reseller of the CLECs' services. Even if the VoIP provider uses different CLECs for origination and termination (i.e., "tail-end hop-off" for outgoing calls), if it is not connecting to other PSTN carriers directly as a LEC, it should not need to be regulated as a LEC. It is essentially like a reseller, or a tenant-service provider, providing (via IP) a "long extension cord" to the PSTN. The underlying CLEC, however, retains its responsibilities. Since a unified, unclassified compensation regime will largely render moot the issue of subscriber location or CPN, the actual location of the VoIP subscriber will not matter for billing purpose. (This is not meant to prejudice the technical question of 911 service, which is outside the scope of this Comment.)

## Summary

IP-enabled calls demonstrate that the existing classification-based regulatory system requires radical reform. Such reform should not, however, create prejudice in favor of one protocol or technology over another.

Computer-to-computer calls that do not make use of the PSTN's switched services cannot, and should not, be regulated. They are an end-user application. Substitutability for the PSTN is not a sufficient reason to attempt to do otherwise.

The boundaries of the PSTN should be regulated, but on a basis that does not classify calls based on origin or technology. Switched Access and local interconnection should be merged into a single regime, with cost-based fees that apply equally to local, IP-enabled, ISP-bound, and interexchange calls. Feature Group A should cease to exist, with local interconnection as its substitute.